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SAR Evaluation Procedures for UMPC Mini-Tablet Devices

This document describes the SAR test requirements for certain small hand-held tablets and devices of similar form factors that are designed primarily for interactive hand-held use next to or near the body of users. The test procedures are applicable to devices with a display and overall diagonal dimension ≤ 20 cm (~7.9"). These devices are typically operated like a mini-tablet and are usually designed with certain UMPC features and operating characteristics; therefore, the term "UMPC Mini-Tablet" has been used to identify the SAR test requirements for this category of devices. A standard composite test separation distance of 5 mm has been established for testing UMPC mini-tablet transmitters and to maintain RF exposure conservativeness for the interactive operations associated with this type of devices. The same approach and concepts used for wireless routers (also known as hotspot mode) have been applied to UMPC mini-tablet devices.[1] Other than a smaller test separation distance of 5 mm, the same device test setup is used for UMPC mini-tablet devices and wireless routers. Combinations of voice, data, video, gaming and hotspot mode transmissions can be supported in various wireless modes, technologies and frequency bands for hand-held and near-body use conditions by this type of devices.

UMPC mini-tablet devices must be tested on all sides and edges with a transmitting antenna within 25 mm from that surface or edge, at 5 mm separation from a flat phantom, for the data modes, wireless technologies and frequency bands supported by the device to determine SAR compliance. Since the procedures are more conservative than those required for hotspot mode, additional SAR tests for hotspot mode is typically not necessary when UMPC mini-tablet procedures are used. For simultaneous transmission conditions, the procedures described in KDB 648474 are used to determine SAR test exclusion and volume scan requirements. The simultaneous transmission configurations must be clearly described in the SAR report to support the analyses and test results.

Depending on the device form factor, antenna locations, operating configurations and exposure conditions, a test separation distance up to 10 mm may be considered for some devices; for example, certain gaming controllers and dual display smart phones. Under such circumstances, 10-g SAR must also be measured at zero test separation for all measured 1-g SAR configurations to address hand exposure. A KDB inquiry must be submitted to determine an acceptable test separation distance for the 1-g SAR measurements.

Some UMPC mini-table devices have incorporated proximity sensing and power reduction mechanisms to address RF exposure and simultaneous transmission concerns. The following may need to be considered when performing the SAR measurements.

- When SAR to peak location ratio is used to determine simultaneous transmission SAR test exclusion, the X, Y, Z coordinates of the peak locations reported by the zoom scans must be used to

[1] See "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities" in one of the attachment to KDB 941225.

compute the peak location separation, d = Sqrt[$(X_1-X_2)^2$ + $(Y_1-Y_2)^2$ +$(Z_1-Z_2)^2$]. Since SAR systems may be implemented differently in making the coordinates available to users, the manufacturer may need to be consulted to ensure proper procedures are used. Area scan contour plots should be used to illustrate the relative separation of the peak locations in the SAR report.

- When power reduction is applied to selected wireless modes, frequency bands or operating conditions, the standalone SAR measured at full power without power reduction may be used to determine simultaneous transmission SAR test exclusion. However, when volume scan is required for any test configuration that requires power reduction, the maximum output power in the power reduction modes must be used for SAR testing. When different power reduction levels are applied to the wireless modes and/or frequency bands involving multiple simultaneous transmitting transmitters/antennas, additional tests may be necessary to ensure compliance for combinations of full and reduced power conditions allowed by the transmitters. A KDB inquiry is recommended to confirm the test requirements.
- When proximity sensors or similar sensing mechanisms are used to activate power reduction, the reliability and consistency of the triggering distance, in all applicable directions and orientations from the user, must be thoroughly investigated to determine SAR test requirements. The surface, edge or orientation containing the sensor is tested at the normally required 5 mm test separation with power reduction enabled. Additional SAR measurements at the most conservative distance when full power is restored are also necessary. For example, if power reduction can be triggered when the surface or edge is within x ± y mm from the user, SAR measurements are required at full power with a separation of x - y mm to show compliance. The automatic power reduction triggering mechanism of an individual test sample may not necessarily trigger at x – y mm to restore device output to full power; therefore, the output power must be set manually with power reduction disabled to perform SAR measurements. The test setup and operating requirements must be clearly explained in the SAR report to support the results.

For larger tablets with a display or overall diagonal dimension > 20 cm, the SAR procedures in KDB 447498 should be used. Tablets with larger form factors or overall dimensions often have additional features to control or restrict transmissions in certain display (portrait or landscape modes) or use orientations; therefore, the test considerations for UMPC mini-tablet devices may not fully apply to the larger tablets. When hotspot mode or other simultaneous transmission configurations exist, certain display or use orientation restrictions may require additional considerations to determine SAR test exclusion. As different tablet designs and use conditions continue to emerge, the SAR test requirements may need adjustments. A KDB inquiry is recommended to ensure the test configurations used are acceptable.

The procedures in this document are required for UMPC mini-tablet and similar devices to be approved by a TCB. When different test procedures are used, a PBA is required. Devices that incorporate power reduction, proximity sensing or need volume scan measurements also require PBA.